



YOUTH DEVELOPMENT THROUGH VETERINARY SCIENCE 5

# Dem Bones, Dem Bones

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## Subject Overview and Background Information:

Movement is essential to animals, and almost all of an animal's daily activities are dependant on the movement of muscles and bones. Animals need muscles and bones to find and eat food, to move from one place to another, and to interact with each other and the environment.

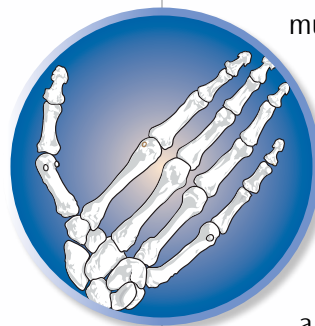
Animals' bodies are configured for a wide range of movements, from simple to complex. To accomplish these actions, muscles move bones by **contracting**, or shortening. When muscles move, they pull bones in specific directions, and it is this simple concept that allows the limbs and bodies of animals to move in precise ways. Without muscles, bones would not be able to move, and without bones, muscles would have little shape and have nothing to pull.

Where muscles are located on an animal's body and where movement occurs is not necessarily obvious. In humans, for example, the muscles that allow us to move our lower arm upward, bending at the elbow, are located in the upper arm, and the muscles that provide for the movement of the upper arm are located in the shoulder. A **flexor muscle** is a muscle of the skeleton that decreases the angle of a limb (e.g., bending

the knee or the elbow). This action is called **flexion**. An **extensor muscle** has the opposite effect on a limb. Extensor muscles **extend** a limb (e.g., straightening a leg or arm), thus increasing the angle. This movement is called **extension**.

Other animals' muscles are configured in ways that are similar to humans, but unlike humans, most other animals have different means of locomotion. For example, strong breast muscles and hollow, lightweight bones allow most birds to **fly**. Horses, dogs, cats, and many other animals are **quadrupedal**, meaning they move on four legs (humans are **bipedal**, moving on two legs), and their muscles and bones must be configured accordingly. Furthermore, snakes and fish have no legs or wings but are able to wriggle their bodies in a **serpentine** fashion to provide locomotion in their environments.

Observing an animal for changes in its normal patterns of movement is important and may provide veterinarians with critical information relative to the animal's health. Abnormal movements (e.g., limping), or lack of movement (e.g., inability to move a limb), may be a symptom or an injury or disease. Whenever a caretaker notices these or other changes associated with an animal's muscles or bones, it is important to consider consulting a veterinarian.



## ◆ Activity Concepts and Vocabulary

- ◆ **Bipedal locomotion (bi-ped-l)**: A form of land animal locomotion using two legs.
- ◆ **Flexion (flek-shuhn)**: The act of bending a joint or limb in the body by the action of flexor muscles.
- ◆ **Flight**: A form of locomotion above the ground.
- ◆ **Limb movement**: Changing the location or position of body parts.
- ◆ **Muscle contraction (kuhn-trak-shuhn)**: The shortening of muscle tissue that allows movement of body parts.
- ◆ **Muscle extension (ik-sten-shuhn)**: The straightening or extending of a limb in the body by the action of extensor muscles.
- ◆ **Quadrupedal locomotion (kwod-row-ped-l)**: A form of land animal locomotion using four legs.
- ◆ **Serpentine locomotion (sur-puhn-teen)**: A form of movement that is typical of a snake, curving in an S shape.

## ◆ Life Skills

- ◆ **Head**: Critical thinking, learning to learn, keeping records, problem solving
- ◆ **Heart**: Cooperation, communication, sharing
- ◆ **Hands**: Teamwork, self-motivation

## ◆ Subject Links

Science and Language Arts

## ◆ State Content Standards Supported

### Science

- ◆ Grade 4
  - *Investigation and Experimentation: 6c, 6d*
- ◆ Grade 5
  - *Investigation and Experimentation: 6h*
- ◆ Grade 6:
  - *Investigation and Experimentation: 7e*

### Language Arts

- ◆ Grade 3
  - *Listening and Speaking Strategies: 1.5, 1.8*
- ◆ Grade 4
  - *Listening and Speaking Strategies: 1.7, 1.8*

- ◆ Grade 5
  - *Listening and Speaking Strategies: 1.5*
- ◆ Grade 6
  - *Listening and Speaking Strategies: 1.5*

## ◆ Purpose of Activities

In Activity 1, “Dem Bones, Dem Bones,” youth will discover which muscles and bones are involved in particular movements. In Activity 2, “Animal Actions,” youth will discover which muscles and bones are involved in the movement of different animals.

## ACTIVITY 1

# Dem Bones, Dem Bones

## Overview of the Activity



There are two parts to this activity. In Part A a youth will have a chance to lift a can and determine which muscles and bones are required to achieve this task. They will first predict the muscles that are used to lift the can, then lift the can, and finally determine if their prediction was correct. Part B is similar to Part A, but this time, youth will lift their leg and determine the bones and muscles used in this action.

## ◆ Time Required

25 to 40 minutes

## ◆ Suggested Groupings

Pairs or small groups

## ◆ Materials Needed for Each Pair or Small Group

(\*Materials provided in curriculum)

- ◆ \*Human Diagrams: bones of human arm, bones of human leg, and muscles of human body
- ◆ One large, unopened can of soup (or other object of similar weight and size)
- ◆ One piece of flip chart paper
- ◆ Colored markers or other writing utensils (shared materials)

## ◆ Getting Ready

- ◆ Form pairs or small groups.
- ◆ Make copies of the three human diagrams and provide each pair or small group with one copy of each diagram.
- ◆ Provide each pair or small group with one unopened can of soup or other object of similar weight and size.
- ◆ Provide each pair or small group with one piece of flip chart paper and writing utensils.

## Opening Questions

Ask the youth to respond to each question below by sharing their ideas verbally and/or by recording them on the flip chart paper provided.

1. What do you know or wonder about muscles? What do you know or wonder about bones?
2. What daily activities do you do that require the use of muscles and bones? Think of examples that require very simple movements. Think of other examples that require complex movements.
3. Describe different ways you can move your arms and legs. How do these movements relate to your answers to question 2?

## Procedure Part A (Experiencing)

1. As a pair or group, have the youth review the handouts “Bones of Human Arm” and “Muscles of Human Body” and identify the matching areas on their arms.
2. Taking turns, have each member of the pair or group sit at a table with their elbows resting on the table’s edge, their palms turned up, and their forearms flat on the table. Have each member hold a can of soup in their palms. Before making any movements, ask the youth to predict the location of the muscles in their arms that will be needed to lift the can of soup. Ask them to record their predictions on the paper provided.
3. With their elbows still on the table, have the members of each pair or group take turns lifting the can of soup slowly to an approximate 45-degree angle (about halfway to the shoulder by bending

at the elbow) and then lowering it slowly back to the table. Each youth should repeat this exercise 10 times without resting.

4. After all group members have completed the activity, ask them to decide which muscles in their arms did the work to lift the can and which muscles they used to lower the can. Ask the youth to record their observations on the paper provided. How did their observations match their predictions? Ask them to make comparisons between their predictions and their observations.
5. Using a colored marker, have each group draw the areas on the “Bones of Human Arm” diagram where they felt their muscles working for both of these movements.

## Procedure Part B (Experiencing)

1. As a pair or group, have the youth review the handouts “Bones of Human Leg” and “Muscles of Human Body” and identify the matching areas on their legs.
2. Taking turns, have each member of the group stand with their feet together. Before making any movements, ask the youth to predict the location of the muscles in their legs that will be needed to bend their knee slowly and lift one foot off of the ground until their lower leg is parallel to the floor. Ask them to record their predictions on the paper provided.
3. Taking turns, ask each youth to raise their foot slowly until their lower leg is parallel to the floor, hold this position for approximately 2 seconds, and then lower their foot back to the floor slowly. Each youth should repeat this exercise 10 times without resting.
  - **Volunteer Tip:** *The youth may hold onto the wall or the back of a chair for support.*
4. After all group members have completed the activity, ask them to decide which muscles in their legs they used to raise their foot and which muscles they used to lower their foot back to the floor. Ask the youth to record their observations on the paper provided. How did their observations match their predictions? Ask them to make comparisons between their predictions and their observations.

- Using a colored marker, have each group draw the area on the “Bones of Human Leg” diagram where they felt their muscles working for both of these movements.

## Sharing, Processing, and Generalizing

Follow the lines of thinking developed through general thoughts, observations, and questions raised by the youth as they share and compare their thoughts and observations. If necessary, use more targeted question as prompts to get to particular points, such as:

- What body movements (arm, leg) did you experience? How did your muscles work in order to make your body move the way it did? Please explain.
- What did you notice about the locations of the muscles relative to where the movement occurred? Please explain.

## Concept and Term Discovery/Introduction

Volunteers need to ensure that the concept of **limb movement** and the terms and concepts **muscle contraction**, **muscle flexion**, and **muscle extension** have been introduced or discovered by the youth.

- Note:** The goal is to have the youth discover the concepts and terms on their own. It helps if they can define terms and concepts using their own words.

## References

- ArtsAlive.ca. Glossary of human anatomy terms. ArtsAlive.ca Web site, <http://www.artsalive.ca/en/dan/dance101/anatomy.asp>.
- Dyce, K. M. 1987. Textbook of veterinary anatomy. Philadelphia: Saunders.
- Ritchison, G. Biology 301, Human physiology lecture notes. 3: Muscle. Eastern Kentucky University Department of Biological Sciences Web site, <http://people.eku.edu/ritchisong/301notes3.htm>.
- Sherwood, L. 2004. Human physiology: From cells to systems. 5th ed. Belmont, CA: Brooks/Cole.

## ACTIVITY 2 Animal Actions

### Overview of the Activity



In this activity, youth will observe different animal pictures and predict how these animals move. They will try to determine the muscles and bones used by these animals. Then they will compare the movements of these different animals and determine what is similar, what is different, and why these movements are important to these animals.

### ◆ Time Required

20 to 30 minutes

### ◆ Suggested Groupings

Pairs or small groups

### ◆ Materials Needed for Each Pair or Small Group

(\*Materials provided in curriculum)

- ◆ \*Animal illustrations: snake, dog, bird, and fish
- ◆ Flip chart paper
- ◆ Colored markers

### ◆ Getting Ready

- ◆ Form pairs or small groups.
- ◆ Make copies of the animal diagrams and provide each pair or small group with one copy.
- ◆ Provide each pair or small group with one piece of flip chart paper and writing utensils.

## Opening Questions

Ask the youth to respond to each question below by sharing their ideas verbally and/or by recording them on the flip chart paper provided.

- What do you know about how animals move?
- How do you think the ways animals move similar to how humans move? How are they different?

## Procedure (Experiencing)

1. Provide each group with a copy of the animal diagrams. Ask each group to try to explain the way these animals move. Have the groups share their ideas verbally and/or record their thoughts and ideas on the paper provided.
  - **Volunteer Tip:** *Encourage the youth to “act out” the movement of these animals. What muscles are involved? How can this help explain these different types of movement?*
2. Have the groups compare the different types of locomotion. How are they similar? How are they different? Have the groups share their ideas verbally and/or write their responses on the flip chart paper provided.
3. Ask each group write down five reasons why movement is important for each of these animals. What similarities exist? What differences? How do these reasons compare to reasons why movement is important to humans? Have the groups share their ideas verbally and/or record their thoughts and ideas on the paper provided.

## Sharing, Processing, and Generalizing

Follow the lines of thinking developed through general thoughts, observations, and questions raised by the youth as they share and compare their thoughts and observations. If necessary, use more targeted question as prompts to get to particular points, such as:

1. How do you think movement is important to the different animals in this activity? Please explain.
2. How do you think the shape of an animal or its body structures (e.g., fins, wings) is important

to its movement? How does this relate to the environment in which it lives? Please explain.

## Concept and Term Discovery/Introduction

Volunteers need to ensure that the concepts of **bipedal** (humans), **quadrupedal** (dog), and **serpentine** locomotion (fish and snake), and **flight** (birds) have been introduced or discovered by the youth.

- ♦ **Note:** The goal is to have the youth discover the concepts and terms on their own. It helps if they can define terms and concepts using their own words.

## Concept Application

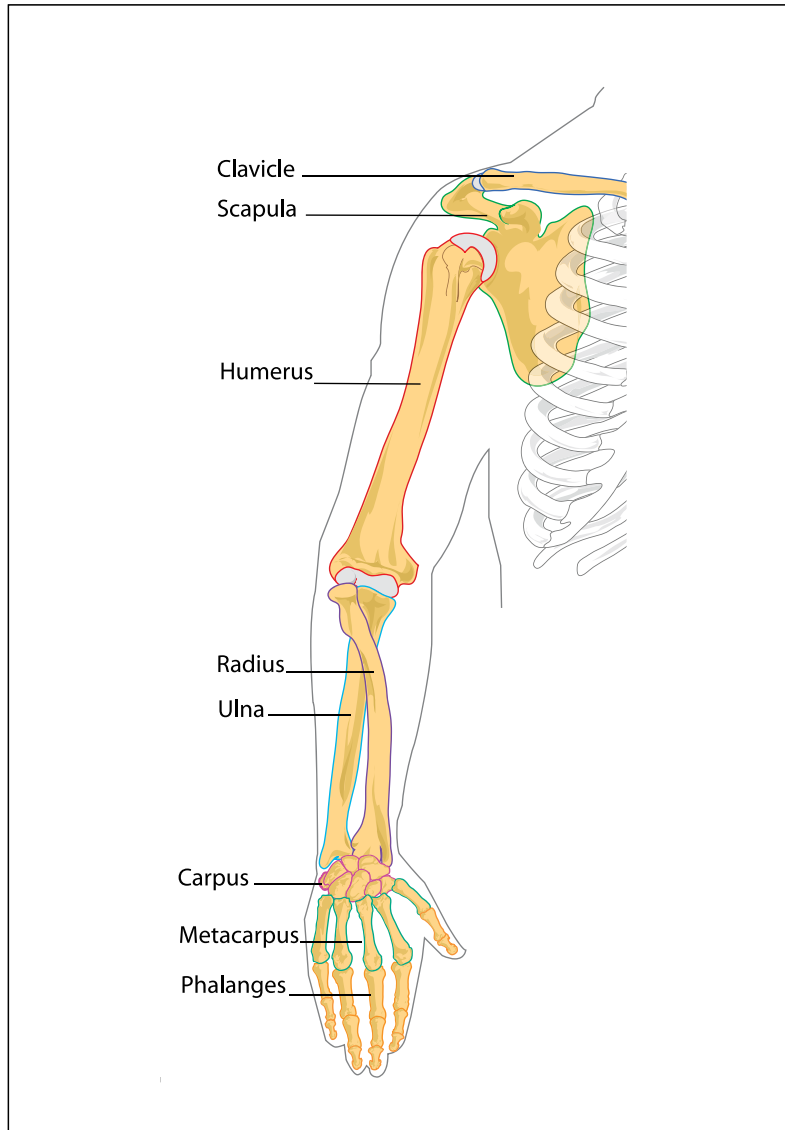
1. Take a field trip or make a family outing to a zoo, wildlife park, or nature center. Observe the different types of animals. Compare their movements. How are they similar? How are they different? What unique types of movements do some have that others do not? What do you think are the purposes of these unique movements?
2. Have the youth make a chart and compare the different types of movements that they make throughout the day (e.g., running, walking, lifting, throwing, bicycling) and identify parts of their body (bones and muscles) involved in each activity. What similarities are there? What differences? Please explain.

## References

- Biewener, A. A. 2003. *Animal locomotion*. New York: Oxford University Press.
- Ramel, G. *Locomotion*. Earth-Life Web site, <http://www.earthlife.net/mammals/locomotion.html>.



## Bones of the Arm

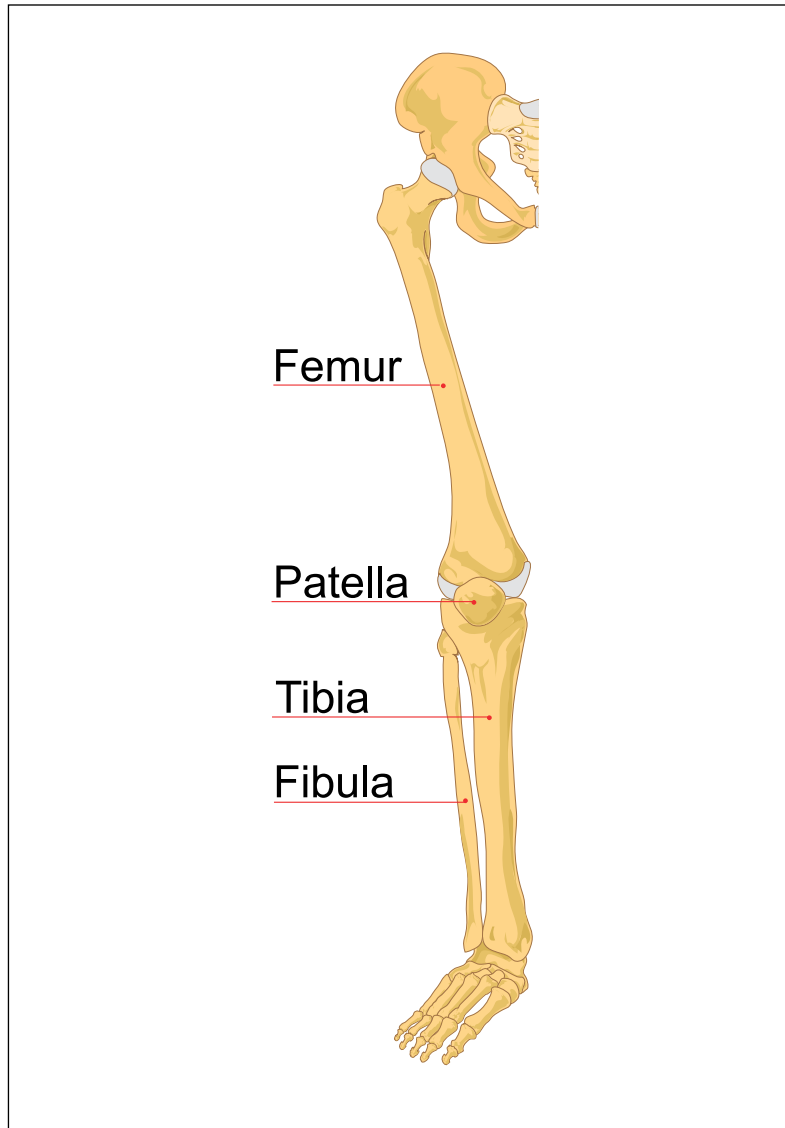


Mariana Ruiz Villarreal

[http://commons.wikimedia.org/wiki/Image:Human\\_arm\\_bones\\_diagram.svg](http://commons.wikimedia.org/wiki/Image:Human_arm_bones_diagram.svg)



## Bones of the Human Leg

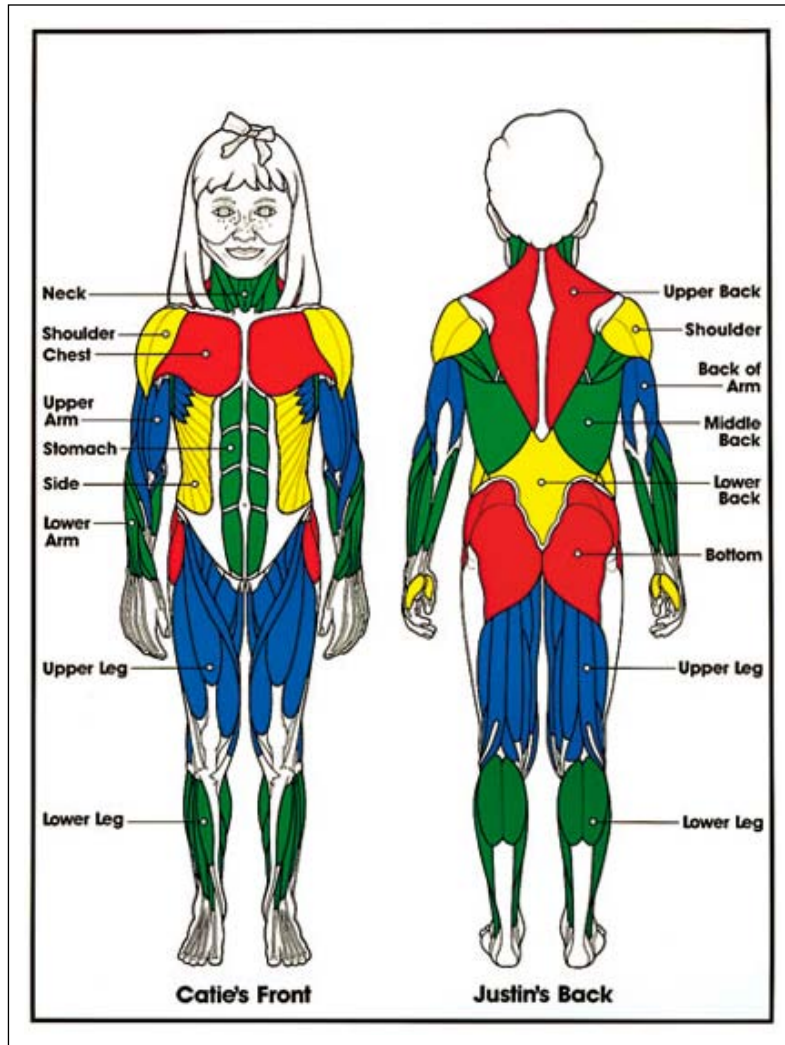


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[http://en.wikipedia.org/wiki/Image:Human\\_leg\\_bones\\_labeled.svg](http://en.wikipedia.org/wiki/Image:Human_leg_bones_labeled.svg)



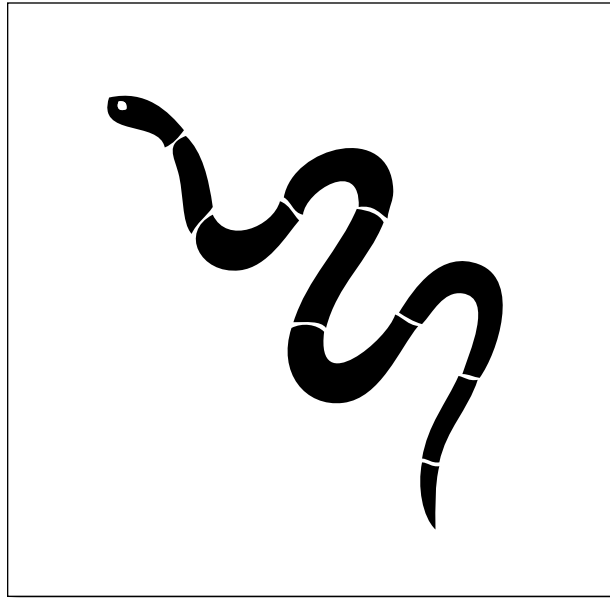
## Muscles of the Human Body







## Snake





## Photo of a Snake

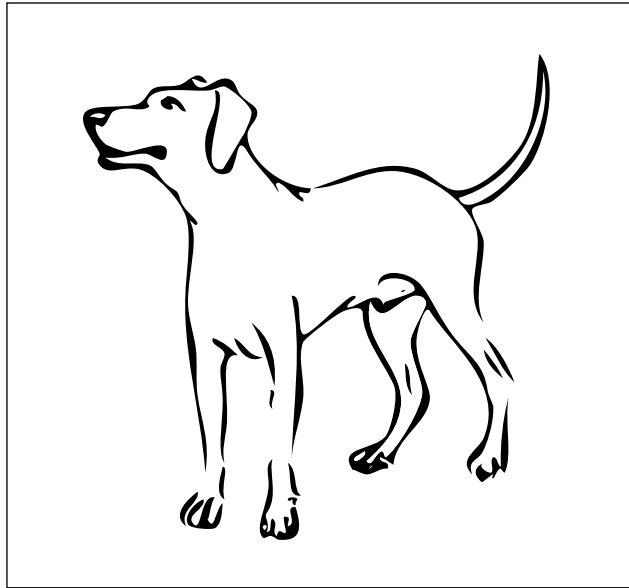


Benny Mazur

<http://www.flickr.com/photos/benimoto/2913108831/>



**Dog**





## Photo of a Dog



Petr Kratochvil

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**Bird**





## Photo of Birds

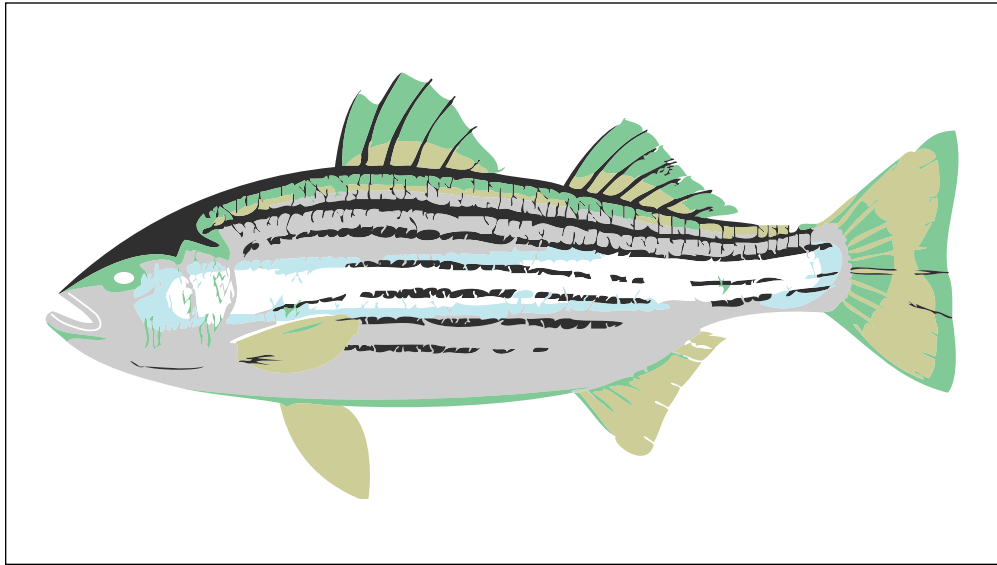


Jude

[http://www.flickr.com/photos/jude\\_the\\_obscur/2637263377/](http://www.flickr.com/photos/jude_the_obscur/2637263377/)



## Fish





## Photo of a Fish



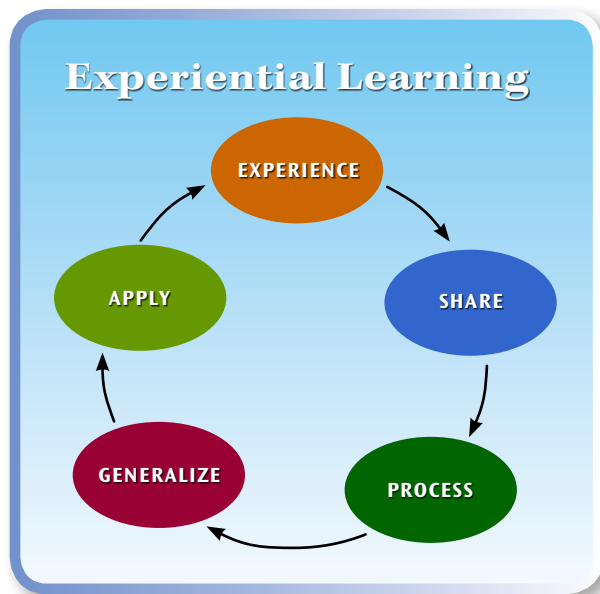
Petr Kratochvil

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## Appendix

The activities in this curriculum are designed around inquiry and experiential learning. Inquiry is a learner-centered approach in which individuals are problem solvers investigating questions through active engagement, observing and manipulating objects and phenomena, and acquiring or discovering knowledge. Experiential learning (EL) is a foundational educational strategy used in 4-H. In it, the learner has an experience phase of engagement in an activity, a reflection phase in which observations and reactions are shared and discussed, and an application phase in which new knowledge and skills are applied to a real-life setting. In 4-H, an EL model that uses a 5-step learning cycle is most commonly used. These five steps—Exploration, Sharing, Processing, Generalizing, and Application—are part of a recurring process that helps build learner understanding over time.



For more information on inquiry, EL and the 5-step learning cycle, please visit the University of California's Science, Technology, Environmental Literacy Workgroup's Experiential Learning Web site, <http://www.experientiallearning.ucdavis.edu/default.shtml>.

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